CONSTRUCTIVELY SPEAKING

US Army Corps of Engineers—Afghanistan Engineer District—North

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Issue No. 7

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Quality Assurance Branch

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Yvan Nobile, *Lead Electrical*
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CAUSE AND EFFECT

A Ponderance of Thoughts

By: Phillip Di Salvi, Senior Scheduler, Baker Group

We've all heard the cliché "Time is money". This kernel of truth has never been more relevant than when associated with construction projects. And for the contractor, cost and schedule are two of the most important functions in controlling and managing their projects. However, there is a third factor having a direct effect on cost and time; and that would be ***quality***. Quality, or the lack thereof, can make or break a contractor's schedule and by extension, his budget. Delivering a quality product on time and within budget is essential to the success of any project.

Quality of work in place and schedule concerns can be at odds when one is forced to take precedence over the other. Often a scheduled duration will fail to take into consideration specific quality control requirements. These issues must be carefully considered and defined on the front end of the project so that there are no conflicts in working towards meeting the goals of each.

Project success cannot be achieved without first effectively planning the work and developing a realistic baseline schedule. When developing a baseline schedule all known variables must be taken into consideration. Then of course, there is Murphy's Law; "What can go wrong will go wrong"; contractors need to also plan for the unexpected. So in addition to anticipated variables, schedule baseline logic needs to take into consideration the potential for unforeseen occurrences along the way.

This effort requires the input of many sources including the design team, project manager, project superintendent, and the use of historical data and corporate experience on similar projects. An intimate understanding of the work scope in concert with knowledge of local means and methods is necessary in order to prepare a credible work plan leading to a realistic sequence of activities with development of the activity logic, which is requisite to preparation of a realistic baseline schedule.

Cont'd

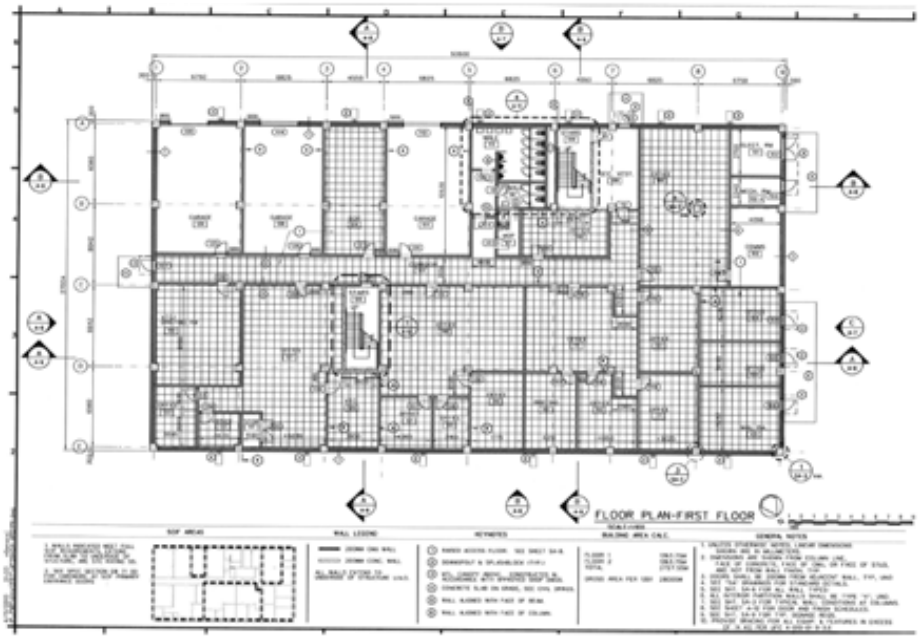
CAUSE AND EFFECT

A Ponderance of Thoughts (cont'd)

Managing a construction project is impossible without a realistic schedule. The contractor's plan, when complete and incorporated into a baseline schedule, is intended to establish a realistic goal for the project completion, cost expenditures, and resource usage; and will identify specific tasks and methods for executing the work.

Once construction has started the contractor's focus must be on managing the project. After the baseline schedule is reviewed and accepted, the contactor can utilize the schedule as a tool to effectively manage and control the work effort. In order to do so, the contractor must maintain his schedule periodically by correctly updating the schedule based on accurate as-built data. If the information in the schedule is incorrect or does not reflect reality, it is no longer relevant for planning and managing the work.

Using the schedule to manage the work is clearly an important factor in overall project management. However, the quality of work in place is also a factor to the contractor's scheduled progress and overall project cost. When a contractor is forced to remove foundations due to unacceptable quality; and re-form, install rebar, and pour and cure new foundations, he will lose time on the project's critical path thereby delaying the entire project. As a result, the contractor's costs are increased exponentially.



Furthermore, it is critical that any re-work required is fittingly captured on the schedule since this additional effort consumes resources that could be used on critical path work or elsewhere in the project. It is imperative that these activities are added to each update schedule as they occur

The contractor's success is directly tied to the Corps' success; if the contractor is successful, the Corps is successful. We are partners with the contractor in the success of each project. As such, sometimes we need to push the contractor over the finish line, while in other cases we may find it necessary to pull the contractor to the finish line…success may require taking a hard position with the contractor while at other times it may involve hand holding.

Assisting the contactor with quality control is a function of that partnership. Effective inspection of work in place as it occurs as opposed to after the fact can greatly assist the contractor in eliminating delays to the project and further support his efforts.

Moreover, quality control has a direct impact on the project schedule. For example, if in-wall electrical or plumbing rough-in work had not been inspected prior to covering, and later the interior wall plaster and ceramic tile had to be removed for rework, the project might be delayed; or had a contractor placed building foundations on unacceptable subgrade, and the entire structure had to later be demolished, the time and cost impacts resultant to such delay would be monumental to the contractor and the Corps. Might these conditions have been prevented by better site inspections; or do we view these conditions entirely as the contractor's oversight. Alternatively, could we better support the contractors in their efforts and possibly eliminate the majority of such schedule impacts by early detection and resolution of defective work?

Cont'd

CAUSE AND EFFECT

A Ponderance of Thoughts (cont'd)

"A stitch in time saves nine"; as I recall one of my grandmother's favorite dictums. If the contractor on the referenced project was terminated and the project rebid with the demolition scope added to a new contract, it would result in additional costs to all parties, and the end user move-in being delayed. Consequently, a project that proceeds significantly beyond the original scheduled completion date would cost the taxpayer considerably more than it might have; not to mention the added time and costs to the Corps. In recalling my grandmother's words of wisdom…caught early, the original contractor might today have completed the project.

Far be it from any who were not intimately involved in a project, with conditions described above, to second guess what might have occurred; however, it can be noted that if we proactively support the contractor with quality control, we can potentially save a project from failure. Each time a contractor is forced to tear out completed work due to poor quality, he delays his work which additionally increases his costs. Assuredly, we can take the position that it's the contactor's responsibility; and contractually we may very well be correct. However, in so doing we fail to provide the necessary support to the project and may by default even contribute to the delay.

Of course if the contractor cannot recover the lost time, liquidated damages (LDs) may be assessed against the contract. Moreover, as a result of the threat of LDs, the contractor will be looking for ways to mitigate his responsibility for delaying the project through emphasizing unrelated Corps delays or asserting concurrent delay. This only serves to convolute the issues, and in the long run increase costs to all parties. Accordingly it's always better to support the contractor in his success than to be party to a claim resultant of his failure.

Likewise, the quicker the ANA and ANP bases are built and the Afghan army stood up, the sooner our military can go home. As a result, proactively supporting the contractor to a successful project conclusion will without doubt save American lives.

Ensuring the quality of work in place and project quality control is a team effort. A proactive team approach to quality will have a direct positive effect on the project schedule. This effort in conjunction with utilizing a properly updated schedule to manage and plan the work will assist the contractor in realizing a successful project.

The Quality Assurance Branch would like to extend a special thanks to Phillip Di Salvi and the rest of the staff at Baker Group for providing such valuable information to the newsletters in addition to the outstanding job they do in reviewing our schedules and providing training to contractors. Thanks for a JOB WELL DONE!

FOUR COMPONENTS OF GROUNDING

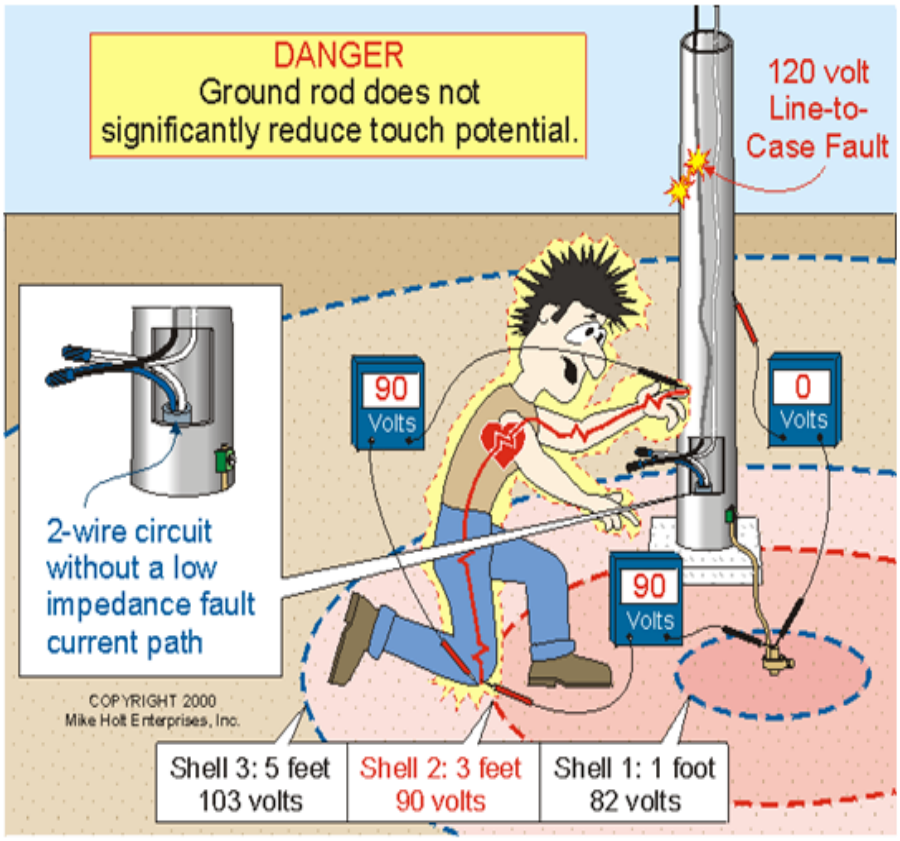
By: Daniel Shaver, Electrical Engineer

There are at least four factors involved with grounding and the field the answer is often, " Let's drive more ground rods and we will be all right." The goal of this article is to introduce you to a few more tools for your "grounding" tool belt.

1. Grounding Electrode- A ground rod is one of six grounding electrodes recognized by the National Electric Code (NEC). The grounding electrode is part of the building so lightning has a place to go during a strike. But contrary to popular belief, ground rods (and other electrodes) do not make the voltage of the building equal to zero. The second grounding method addresses voltage.

2. Bonding - While we can never make our building equal zero volts to ground, we can connect all of the metal parts (that are not meant to carry current) in the building so that there is zero volts relative to each metal part. If there is no relative voltage to drive current, then people won't be shocked under normal conditions and the voltages to our appliances will be stable.

If we are safe from lightning and have stable voltage then what else is there to worry about? Suppose the installation is not quite right or something nicks an electrical cable, then we have what is called "ground fault." In this case, the open wire is a current source that forces current into the building. The current "creates" a path back through the building to ground and eventually back to the power source. These paths through the building cause fires, and if someone touches metal or water (there are minerals in water that conduct electricity), then that person becomes a current path and is shocked. But what if there is a ground rod connected directly to the equipment?



In the picture, we see a person working on overhead exterior light. The pole has a ground rod and a "hot" wire touches the pole., but the current goes through the man and the ground rod. The missing piece in this case is the direct path for the current to return to the source. Even though a system is grounded and bonded, there is a need for protection from ground faults, and so we add two more tools to our grounding tool belt; the equipment grounding conductor and ground fault interrupter.

3. The equipment grounding conductor (the green wire) - Under normal conditions the neutral is a zero voltage, current-carrying conductor and there is virtually no current in the green wire. The green wire is there in case something is wrong. If there is a fault, the green wire is another path back to the power source so that the current will not "choose to create" a dangerous path to ground. In that case, the green wire or equipment grounding conductor becomes the zero voltage, current carrying return path. But it is not enough to provide the fault current with a path to the source. We want to stop the fault current all together.

cont'd

FOUR COMPONENTS OF GROUNDING

4. The Ground fault interrupter (GFCI, GFI or RCD) works like a circuit breaker to stop a fault. But you might ask, I thought that there was already a circuit breaker. Isn't that good enough? The breaker will trip at 20 amps or more. Is that a problem? The following chart gives you an idea of the effects on your body of varying levels of current:

1mA	Barely perceptible (slight "tingle")
16mA	Maximum current an average man can grasp and "let go"
20mA	Paralysis of respiratory muscles
100mA	Ventricular fibrillation threshold
2 Amps	Cardiac arrest and internal organ damage

Note: Amperage is a measure of the "strength" of an electric current expressed in amperes. A milliamp is 1/1000th of an ampere and is abbreviated mA.

So while the twenty amp breaker is helpful in protecting equipment that can tolerate 20 amps, it is not for people "connected" to a circuit. We can see why it is important to have a GFCI that stops fault current at 10 mA in high risk or wet areas, like kitchens, bathrooms and outdoors. Typically we prefer a GFCI receptacle in these areas or GFCI breakers for a series of up to six receptacles on one circuit.

In summary, the grounding electrode (including rods) is for lightning protection and the equipment grounding conductor is protecting against shocks (ground faults). Bonding keeps everything on a level playing field so that voltage is not a problem. GCFI's protect people if all else fails. These four parts of a grounding system work together to help keep us safe.

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CONTRACT DOUCUMENTS IN RMS

By: Colleen Erickson, CAB

We recently sent out an email to everyone asking that you don't put all your correspondence or various miscellelaneous items under the "Contract Documents" section in the Administration Tab in RMS. The Contract Administration Branch and The Baker Group have been working to standardize the Contract Documents in RMS. They have developed a standard list of documents that will be beneficial to anyone that goes into the contract.

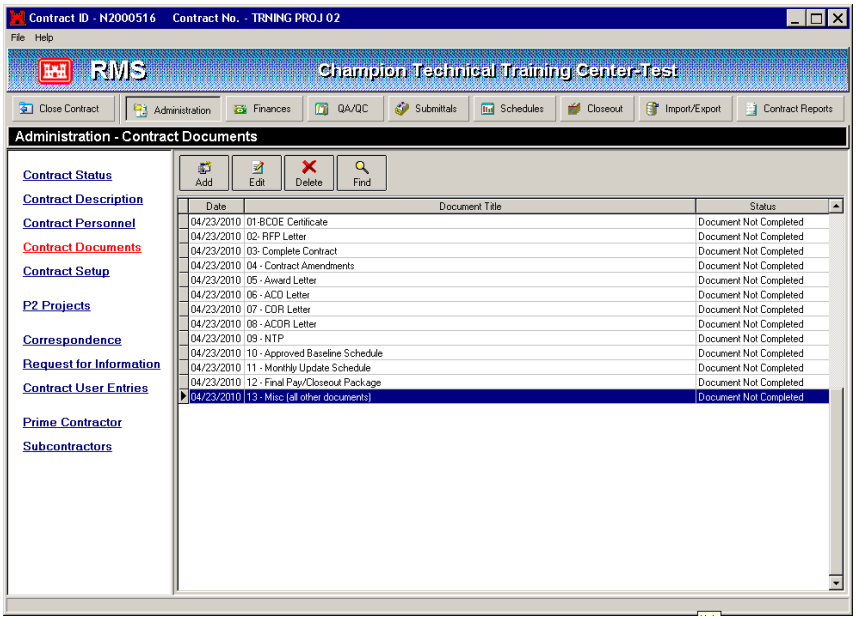
There are currently locations in RMS where you put general correspondence, pay estimates, modifications, RFI's, etc….. Many of you have probably gone to the Contract Documents to find the contract, drawings and NTP only to find that there is no standard naming convention and you find yourself searching through files to see if it's the right one. Although Baker is trying to update these contracts as best as they can, they need your help to locate any of the standard documents that may have never been loaded.

Cont'd

CONTRACT DOUCUMENTS IN RMS

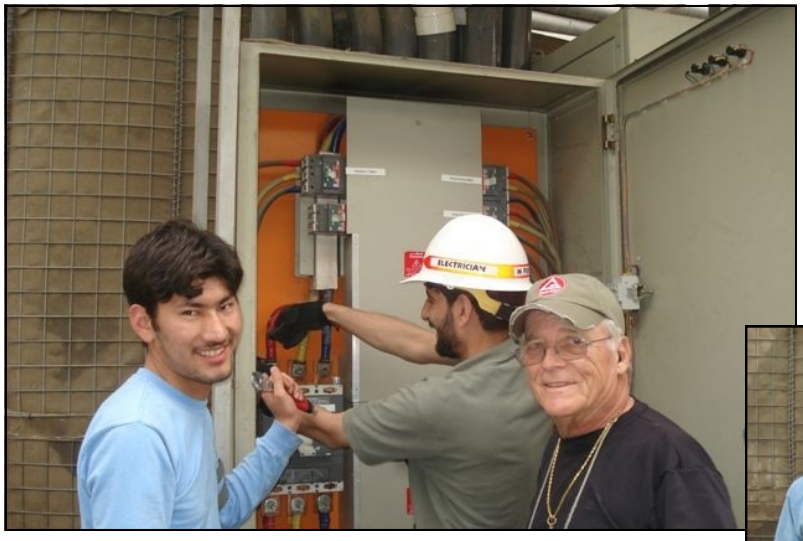
So to further clarify the earlier email, the following is the standard list of files that are to loaded under Contract Documents:

01 – BCOE Certificate
02 – RFP Letter
03 - Complete Contract
04(a) – Contract Amendments
05 - Award Letter
06 - ACO Letter
07 - COR Letter
08 - ACOR Letter
09 - NTP
10 - Approved Baseline Schedule
11 – Monthly Update Schedule
12 – Final Pay/Closeout package
13 – Misc (all other documents)



While CAB, QAB, and Baker are working to ensure that all contract documents from award to closeout are loaded in RMS, the most important piece of this chain is you. If you come across any missing documents please notify CAB via email immediately so the missing documents can be located and loaded in RMS, If you have a document that needs placed in Contract Documents, please contact Colleen Erickson at 540-665-3473.

MENTORING HAS GREAT REWARDS



For the past 6 months, Yvan Nobile has been mentoring two Qalaa House Local Nationals, Mohammed Feroz and Mohammed Taher. They have been working on electrical upgrades on the Qalaa Compound. Yvan says this is the most rewarding part of his job.

From left to right: Hayadullah, Mohammed Taher, Yvan Nobile, and Joe Warn

PROGRESS PAYMENTS
Pay Activities (again)

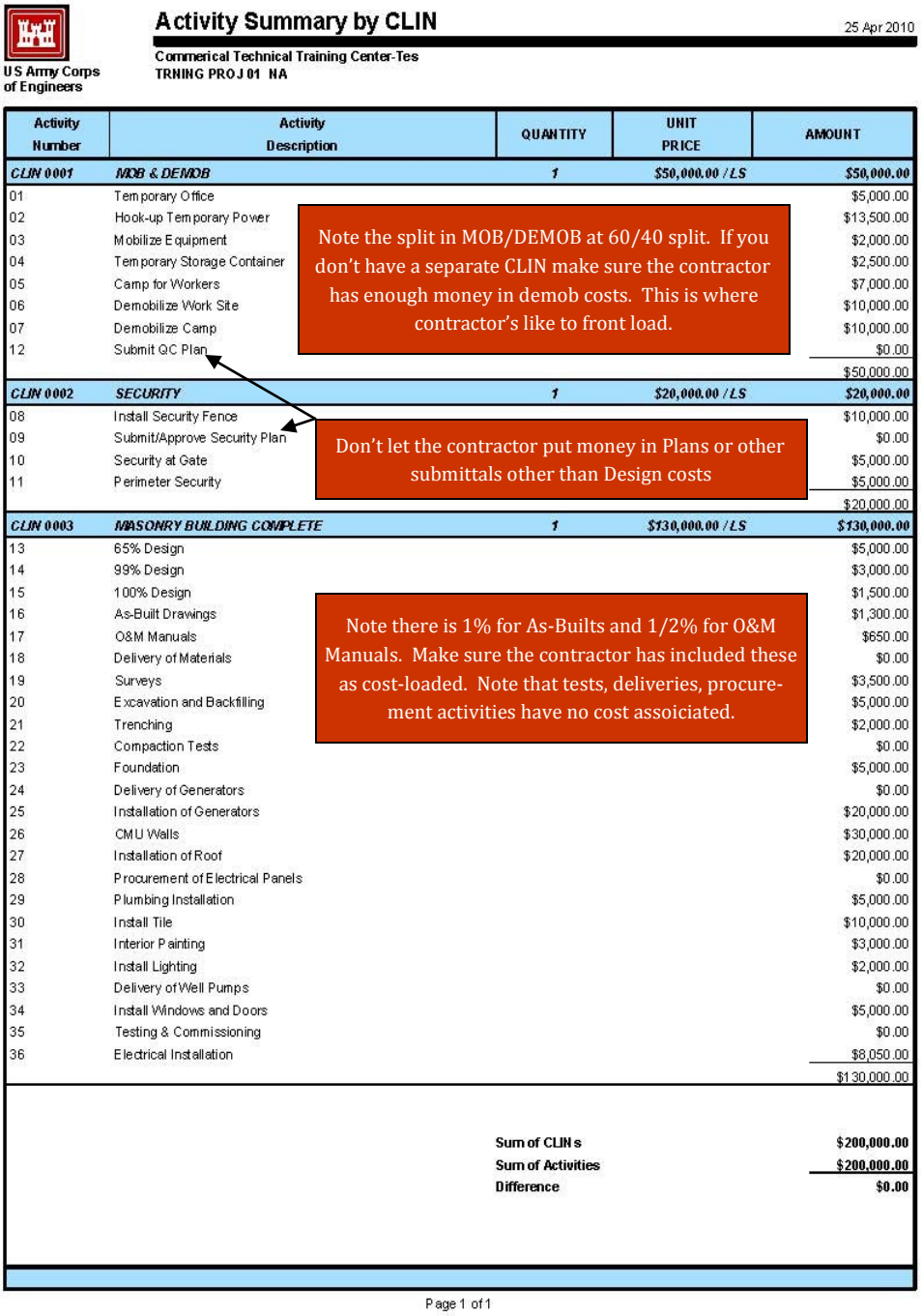
By: Sandy Higgins, Quality Assurance Branch

Back in Issue No. 4 I briefly discussed pay activities and which activities in the contractor's schedule are to be cost -loaded and which ones are not. I've been asked again to do another article on the subject so we'll go in a little more detail and h opefully you can gain a better understanding and not get caught in a position where you have overpaid the contractor. Before I get started, let me first say this "**WE DON'T PAY FOR STORED MATERIALS".** There are two ways that is occurs and one of the ways has been eliminated from RMS altogether. The first way is the contractor shows up with paid invoices of materials and asks you can he get paid for them. There used to be an additional earnings tab in RMS that allowed you to pay this off the top and then back the materials out in a pay activity once the material was installed. That is no longer an option so we won't go any further with that one. The second is the contractor has a cost-loaded an activity such as Delivery of Generators, Procurement of Distribution Panels, Fabrication of HVAC System. Etc…….. **THESE ARE NOT PAYABLE ACTIVITIES**

Cost-Loaded activities are activities in the contractor's schedule that are associated with work in place. Examples of these activities would be Install Windows, Excavation of Site, Placement of Concrete, Trenching, etc……..The amount of the activity will include the cost of material, labor and overhead. For simplicity, I've created a "dummy" project and associated pay activities with the awarded "CLINS". In this case, CLIN 0001 MOB & DEMOB is a separate CLIN so it makes it easier to breakdown.

Whether you have inherited an existing contract or starting up a new contract, **KNOW YOUR PAY ACTIVITIES.**

The biggest problem in overpayment to contractors is that we will give the contractor a multi-million dollar CLIN and ask them to do the budget. It would be much simpler to manage if we could break the contracts into more Sub-Clins so that the money is easier to manage for both the contractor and the folks that have to pay them. If you have any questions or concerns, please feel free to call me or someone in Contract Administration Branch.



US Army Corps of Engineers

Activity Summary by CLIN 25 Apr 2010

Commerical Technical Training Center-Tes
TRNING PROJ 01 NA

Activity Number	Activity Description	QUANTITY	UNIT PRICE	AMOUNT
CLIN 0001	MOB & DEMOB	1	$50,000.00 /LS	$50,000.00
01	Temporary Office			$5,000.00
02	Hook-up Temporary Power			$13,500.00
03	Mobilize Equipment			$2,000.00
04	Temporary Storage Container			$2,500.00
05	Camp for Workers			$7,000.00
06	Demobilize Work Site			$10,000.00
07	Demobilize Camp			$10,000.00
12	Submit QC Plan			$0.00
				$50,000.00
CLIN 0002	SECURITY	1	$20,000.00 /LS	$20,000.00
08	Install Security Fence			$10,000.00
09	Submit/Approve Security Plan			$0.00
10	Security at Gate			$5,000.00
11	Perimeter Security			$5,000.00
				$20,000.00
CLIN 0003	MASONRY BUILDING COMPLETE	1	$130,000.00 /LS	$130,000.00
13	65% Design			$5,000.00
14	99% Design			$3,000.00
15	100% Design			$1,500.00
16	As-Built Drawings			$1,300.00
17	O&M Manuals			$650.00
18	Delivery of Materials			$0.00
19	Surveys			$3,500.00
20	Excavation and Backfilling			$5,000.00
21	Trenching			$2,000.00
22	Compaction Tests			$0.00
23	Foundation			$5,000.00
24	Delivery of Generators			$0.00
25	Installation of Generators			$20,000.00
26	CMU Walls			$30,000.00
27	Installation of Roof			$20,000.00
28	Procurement of Electrical Panels			$0.00
29	Plumbing Installation			$5,000.00
30	Install Tile			$10,000.00
31	Interior Painting			$3,000.00
32	Install Lighting			$2,000.00
33	Delivery of Well Pumps			$0.00
34	Install Windows and Doors			$5,000.00
35	Testing & Commissioning			$0.00
36	Electrical Installation			$8,050.00
				$130,000.00

Sum of CLINs	$200,000.00
Sum of Activities	$200,000.00
Difference	$0.00

Note the split in MOB/DEMOB at 60/40 split. If you don't have a separate CLIN make sure the contractor has enough money in demob costs. This is where contractor's like to front load.

Don't let the contractor put money in Plans or other submittals other than Design costs

Note there is 1% for As-Builts and 1/2% for O&M Manuals. Make sure the contractor has included these as cost-loaded. Note that tests, deliveries, procurement activities have no cost assoiciated.

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PROJECT MANAGEMENT

By: Ron Ballard, PPMD

	Phase	Activity	Forecast Start	Forecast Finish	Actual Start	Actual Finish	Duration (Days)	Pred	Succ
1	1 - Project Initiation	* Customer Outlines Project Goal/Requirements (Proj. Start)	02-Sep-09	08-Sep-09	02-Sep-09	08-Sep-09	7		2
2	1 - Project Initiation	AED Commander Approves Project	09-Sep-09	15-Sep-09	09-Sep-09	15-Sep-09	7	1	7,8,3
3	1 - Project Initiation	Acquisition Strategy Meetings with PDT	16-Sep-09	16-Sep-09	16-Sep-09	16-Sep-09	1	2	4
4	1 - Project Initiation	PM Implements Acquisition Plan (13 Pt Memo)	17-Sep-09	20-Sep-09	17-Sep-09	20-Sep-09	4	3	5
5	1 - Project Initiation	PMP Complete	21-Sep-09	24-Oct-09	21-Sep-09	24-Oct-09	34	4	6
6	1 - Project Initiation	PM Forwards Project to Engineering	14-Jan-10	14-Jan-10	14-Jan-10	14-Jan-10	0	5	9
7	1 - Project Initiation	* Site Assessment	16-Sep-09	02-Feb-10	16-Sep-09	02-Feb-10	140	2	10
8	1 - Project Initiation	* Real Estate (secure site/land commitment)	01-Feb-10	09-Mar-10	01-Feb-10	09-Mar-10	37	2	22
9	2 - Engineering	Refine Scope of Work	15-Jan-10	28-Feb-10	15-Jan-10	28-Feb-10	45	6	10
10	2 - Engineering	Project Cost Working Estimate CWE	01-Mar-10	09-Mar-10	01-Mar-10	09-Mar-10	9	7,9	11
11	2 - Engineering	* Prepare RFP (Request for Proposal) (Engineering Complete)	01-Mar-10	23-Mar-10	01-Mar-10	23-Mar-10	23	10	12,13
12	3 - BCOE	Prepare Source Selection Plan	22-Mar-10	22-Mar-10	22-Mar-10	22-Mar-10	0	11	17
13	3 - BCOE	Field Review	01-Mar-10	05-Mar-10	01-Mar-10	05-Mar-10	5	11	14
14	3 - BCOE	Engineering Incorp. Comments	06-Mar-10	06-Mar-10	06-Mar-10	06-Mar-10	1	13	15
15	3 - BCOE	Baker prepares summary Schedule for RFP	05-Mar-10	05-Mar-10	05-Mar-10	05-Mar-10	0	14	16
16	3 - BCOE	* BCOE Complete	06-Mar-10	09-Mar-10	06-Mar-10	09-Mar-10	4	15	17

Having spent nearly my entire civil service career working in environmental positions at various installations, I can hardly say that I am a seasoned project manager. However, after working for USACE for a little more than a year now, I have gained a wealth of knowledge and experience in project management. Through my interactions with other project managers and many fine engineers, contracting officers, Quality Assurance Specialists (QA), program analysts, and numerous other staff members in performing my duties at GRC and here at AED, I have become aware of the intricacies of project management from pre-award, through construction, to completion. The purpose of this article is to provide an overview of the life cycle of a construction project and to foster increased camaraderie and cooperation by raising awareness of the roles of the various AED members involved in project development and construction.

How is a project born anyway? Well, obviously someone has a need for a new facility, a problem to be solved, or perhaps an idea of how to improve an existing process. That someone is the customer. The customer identifies the need to AED through various channels, perhaps through a coordination meeting, an e-mail or a phone call to the District Engineer, the DPM, a Branch Chief or one of the other senior officials. No matter how the need is relayed, the requirement eventually is assigned to a project manager for development. The project manager (PM) works with the customer to develop a rough statement of requirements and obtain funds and, just like that, a project is born!

One of the PM's first responsibilities is to establish a project delivery team (PDT). As a minimum the PDT includes the PM, the Program Analyst (PA), the Contracting Officer, the Project Engineer, (PE) and the customer. Other team members are added as the project progresses, and eventually includes the contractor after award is made. The PM leads the PDT in managing the project from cradle to grave.

As early as possible the PM must establish a project schedule. In AED we use a database called the Pre Award Scheduling System (PASS). When used properly, this database is a valuable management tool and when the PM enters basic project information, the system automatically generates a schedule, based upon an established set of criteria. The PM's job then becomes to coordinate with the PDT members to keep the project moving through the various stages of development on schedule.

The schedule consists of 30 specific tasks that AED must accomplish to develop and award a contract. Some of the major tasks are:

Acquisition Plan
Project Management Plan
Complete a site assessment and clear real estate issues
Refine the Scope of Work (SOW)
Cost Working Estimate (CWE)
Source Selection Plan
Request for Proposal (RFP)
Solicit proposals
Conduct the Source Selection Evaluation Board (SSEB)
Select the winning proposal
Award the contract

Under ideal conditions this is a fairly easy process, just follow the checklist. However, in a combat zone the PM faces many challenges in coordinating and accomplishing these tasks. One of the biggest challenges during these beginning stages is developing the Scope of Work (SOW). Often the customer lacks sufficient funds or the mission changes and thus the scope must change. A poorly developed SOW will surely lead to customer dissatisfaction, and ultimately a poor reputation for USACE and AED. The Bidability, Constructability, Operability and Environmental (BCOE) review provides an opportunity for Engineering Division, Contract Administration, and the Resident Office (RO) to comment on the SOW to make sure it is accurate and practical.

PROJECT MANAGEMENT

One of the primary roles of the PM is to coordinate with the customer. During pre-award activities the PM secures funding and customer approval of proposed courses of action. After award the PM maintains close contact with the Resident office, keeps the customer informed of progress and relays any customer driven changes to the Resident Office. The Resident Office incorporates customer requested changes as contract change orders or modifications (mod), if the requests can be accommodated. The PM also advises the customer of any engineering modifications that are required to produce a complete and usable facility. Normally, the PM is the single point of contact for the customer. He/she keeps information flowing and prevents confusion, thus helping to keep the project on schedule and within budget. The PM also controls the budget and ensures that modifications are not issued until funds are available.

A critical element of pre-award is the Source Selection Process. Perhaps the most important element of this process is conducting the Source Selection Evaluation Board (SSEB). The SSEB normally consists of 2-3 board members and one chairperson. Using the solicitation documents, the board evaluates proposals from all offerors and submits the findings to contracting. The selection authority assesses the board's findings and selects the firm to whom the contract will be awarded. The KO then makes the award.

SSEB members independently rate proposals, then discuss the ratings to reach consensus.

The PM has a key role in improving the source selection process as he/she is responsible to write a good SOW and to assemble high quality RFP documents. Engineering's Bid Package Manager (BPM) takes the PM's documents and assembles a package consisting of the SOW, the BCOE certification, and special clauses. The BPM then forwards the RFP package to contracting for solicitation. Since the SSEB and Contracting make all decisions on the documents produced through the efforts of the PM and Engineering, it is extremely important that the PM and the Bid Package Manager closely coordinate their efforts. It is also very important that SSEB members thoroughly review proposals. If you are chosen to serve on a SSEB it is imperative that you embrace your duties and do the best that you can. We will all reap the benefits of your efforts. If you want to learn more about the source selection process I recommend that you download and read the Army Source Selection Manual, February 26, 2009 version. Google it!

Reaching consensus is not always easy. Consenus is not simply an averaging of ratings; all members must agree on the ratings. This often involves heated discussions between board members, but hopefully does not lead to physical violence .

After the contracting officer (KO) has awarded the contract, the winning bidder enters personnel information into the Synchronized Pre-deployment Operational Tracker (SPOT) database and submits proof to contracting that he has met the requirements for Defense Base Act (DBA) insurance, including premium payment. The next step is issuing the Notice to Proceed. When this is completed the contract is officially moved into construction for execution.

Cont'd

PROJECT MANAGEMENT

When the contract is assigned to a specific Resident Office, it is now time for the PM to develop a good working relationship with the Resident Office and to let them know that the PM will work closely with them to resolve any issues that may arise during the construction phase. The PM should try to visit construction sites as often as possible. Status reports, e-mail and phone calls are all good tools for the PM to keep informed, but nothing substitutes for the actual eyes-on experience.

Recently I had the opportunity to visit two road projects in the Panjshir Valley. The Resident Engineer provided me with reports on issues with the projects, but I just didn't get it. One of the issues involved a retaining wall at the "Blue School". Honestly, I just could not understand the significance of this retaining wall in reference to the road construction project. However, after visiting the project site and the school, I then came to realize the relationship. Due to inadequate drainage, the retaining wall at the school was failing and threatened the integrity of the road. This perspective could only be gained by personally observing the problem, and the newly found perspective allowed me to brief the customer on the problem so that he could pursue a project to repair the wall.

The Blue School sits at the base of a snow capped mountain in the Pansjir Valley. Because of poor drainage snow melt threatens the newly constructed Doha Bridge to Dara District Road.

Tim Gouger, Bagram Off-Base Resident Engineer discusses punch list items with the contractor for the Doha Bridge to Dara District Road.

Upon completion of construction the Resident Office performs a final inspection of the contracted facility. This inspection normally yields a "Punch List" of items that the contractor must complete before final acceptance and payment. When all work is complete it is time to turn the facility over to the customer. The Resident Office is responsible for preparing the turnover of property with a DD Form 1354. The PM can usually assist in obtaining this signature if required.

Now I will discuss close out. Well, I guess not. Perhaps someone else can go there in future editions of *Constructively Speaking*. However, I do want to leave you with some closing thoughts. What is your role in project management? How can you help move projects along? How can you help the PM? How can the PM help you? Communication is the key. The better we communicate within AED, the better we can meet our customers' needs, and we all benefit from that.

KEENUM'S QUOTE:

"Each of us is carving a stone, erecting a column, or cutting a piece of stained glass in the construction of something much bigger than ourselves." – *Adrienne Clarkson*

CONSTRUCTION TERM:

Plumb Bob: usually a conical metal weight attached to the end of a plumb line. Also called plummet.

Submitted by: DANIEL KEENUM, QUALITY ASSURANCE BRANCH

P-TRAPS

By: Steve Baughman, Mechanical Engineer, QAB

P-traps… Time and time again the same plumbing errors keep coming up and causing trouble here in Afghanistan and the P-trap is one of the biggest. The P-trap is often not included in the plumbing and when it is what we often get is a flat trap (See picture 1 below).

I've heard it explained many times, "We've measured it and it is ok." Really, you've measured it and its ok? What did you measure? What makes it ok, or to be more correct what makes it code compliant? Petey the P-trap: Let us examine this little guy and figure out what makes him tick and why he might be a bit on the dysfunctional side. We'll be kind, after all Petey means well he just doesn't know the code or how it applies to himself. Maybe we can help.

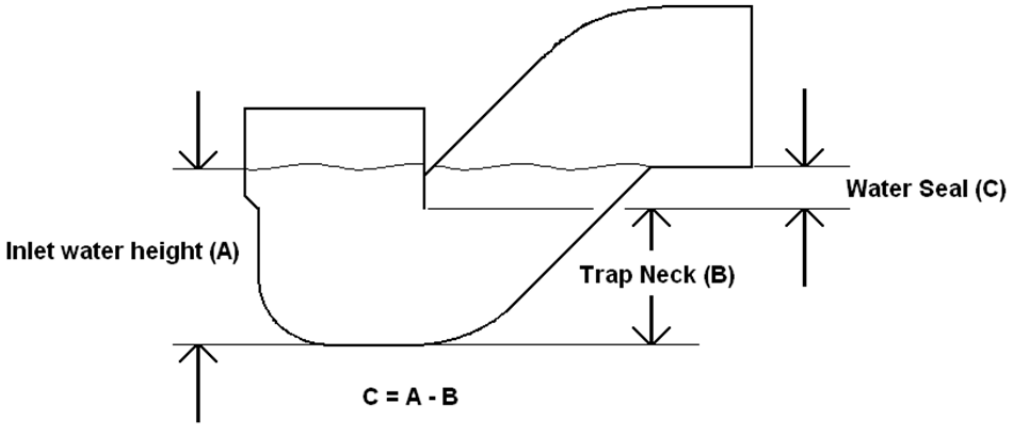
Picture 1

The International Plumbing Code (IPC) discuses the requirements for traps in chapter 10: Traps, Interceptors, and Separators.

"Each fixture trap shall have a liquid seal of not less than 2 inches (51mm) and not more than 4 inches (102 mm)… Where a trap seal is subject to evaporation, a strap seal primer valve shall be installed…" 1002.4 Trap seals

What is a liquid seal and how is it measured? This question seems to be the prevalent issue, one with much discussion and debate. If we cut the p-trap down the middle and examine the inside of the trap we can begin to understand what the issue is and how to resolve it. Picture 2 is a simple diagram of the p-trap and helps to illustrate the issues as we examine the liquid seal question.

Inlet water height (A) is the amount of water that can be measured standing in the bottom of the drain pipe as it connects to the p-trap. As we will see, this depth (A) can be greater than 2 inches (51 mm) and still not provide 2 inches of liquid seal to the trap.



Trap Neck (B) is the narrowest inner diameter of the trap and will define the amount of water that must be measured in inlet water height (A) to provide proper seal. As can be seen in Picture 3, the water level up to the level of the top of the trap neck (B) does nothing to prevent gases from passing from the outlet to the inlet of the trap.

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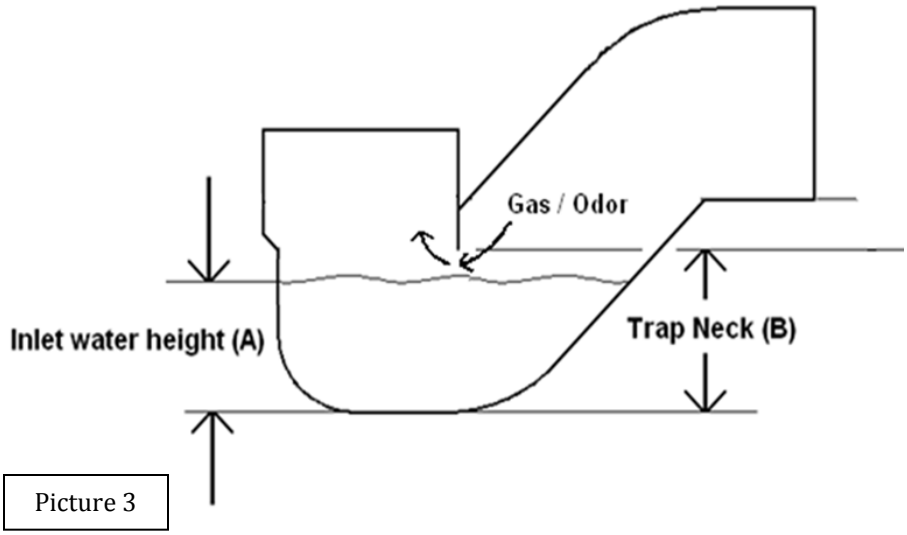
The water level, defined by the trap neck (B), is necessary to allow for the passage of the solid and liquid waste from the inlet to the outlet. The greater the discharge from the fixture the greater the trap neck size to allow for proper water flow. Water pressure is measured based upon the height of water from the top of the water level to the point of interest. If gasses are trying to pass through the water in the p-trap then they must have sufficient pressure to push their way down to the top of the Trap Neck (B) and then bubble up on the other side and out of the inlet. Therefore, the depth that the gases must penetrate will be defined by the distance from the top of the outlet water level to the top of the Trap Neck (B) and is defined in picture 2 as Water Seal (C). You can see that this is less than the entire depth of water that would be measured to the bottom of the Trap Neck (B) by measuring inlet water height (A). As a result inlet water height (A) will always be greater than Water Seal (C) by an amount equal to the Trap Neck (B).

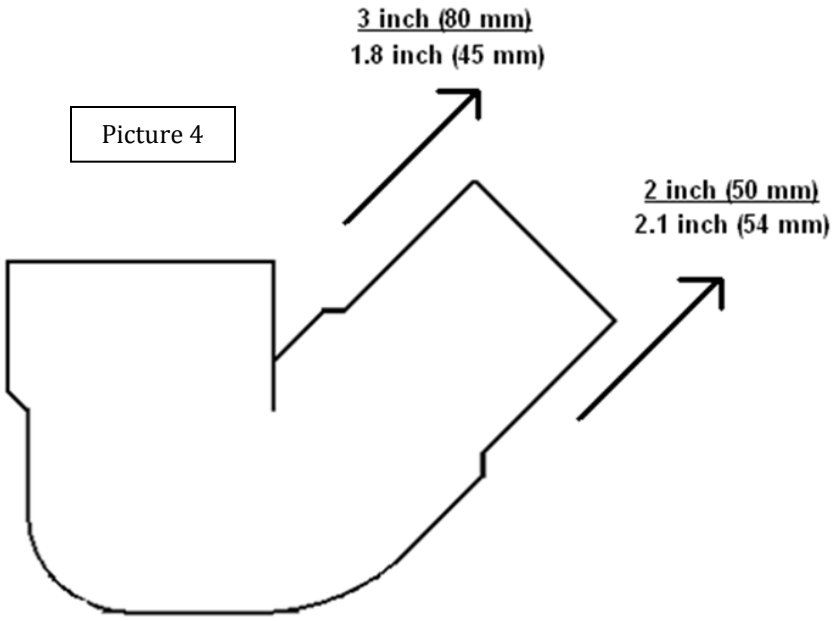


Picture 3

Again, Water Seal (C) is the difference between the top of the water level on the outlet to the top of the Trap Neck (B). At this point it is important to point out that the water level on both sides of the p-trap will be the same height in relation to the bottom of the p-trap. Remember that pressure of water is dependent upon height and not width of water since pressure is force per unit area. So, if the atmospheric pressure is the same on both the inlet and the outlet, the water levels on both sides will be equal because the pressure will be equal. Now with the understanding that the water level height will be the same for the inlet and the outlet (at least with respect to the bottom of the p-trap) we can arrive at a method for inspecting or measuring the water seal of a p-trap.

First, if we can measure the Trap Neck (B) and the Inlet Water Height (A) we can determine the Water Seal (C) as the difference between A and B. This means for any given p-trap style and size we have a method for measuring the water seal (C).

As an example, a sample 3 inch p-trap was provided by the USACE Construction office (shown in picture 1). Taking the sample 3 inch (80 mm) p-trap and filling it with water until the outlet started to overflow, the depth of water at the inlet (A) was measured as 2.75 inches. The neck of the trap (B) was measured as 2 inches. The result is that the Water Seal (C) is 2.75 – 2.00 = 0.75 inches. This is significantly less than the required 2 inches (51 mm) of liquid seal as required by code.



Picture 4

Additionally a sample 2 inch p-trap was provided by the USACE Construction office. Taking the sample 2 inch (50 mm) p-trap

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and filling it with water until the outlet started to overflow, the depth of water at the inlet (A) was measured as 1.875 inches. The neck of the trap (B) was measured as 1.375 inches. The result is that the Water Seal (C) is 1.875 – 1.375 = 0.5 inches. Again, this is significantly less than the required 2 inches (51 mm) of liquid seal as required by code.

Picture 5

Both of these traps were Millifactories brand PVC p-traps and these are the p-traps that I have seen most often in country.

So Petey is a bad non-code compliant little monster right? Not necessarily. Part of the problem is that the p-trap levels off to horizontal on the outlet too soon. These P-traps are manufactured in two pieces (see picture 1), a trap portion and a 45 degree elbow. The trap portion has a female inlet connection and a male outlet connection. The outlet is sloped up and away from the trap at 45 degrees to the horizontal plane. The 45 degree elbow has a female connection on each end. The earlier measurements taken were based on the installation of the trap and the immediate 45 degree elbow. If space is sufficient the outlet of the p-trap can be allowed to continue on at the 45 degree upward slope until it reaches sufficient height to achieve a water seal of 2 inches (50 mm) and then the 45 degree elbow can be connected. The 3 inch (80 mm) trap needs a minimum of 1.8 inches (45 mm) of extension prior to the 45 degree elbow and the 2 inch (50 mm) trap needs a minimum of 2.1 inches (54 mm) of extension (See Picture 4).

So if we install Petey with an extension prior leveling off we should be ok and he will not be a bad little trap after all. Great! How do we insure or check that this has been done when troubleshooting an existing problem? Well, let us assume for a moment that I have a problem with the toilet in picture 5.

Flush the toilet completely, several times to clean out the trap.

Slowly fill the trap with water until he will hold no more by pouring water down the drain.

Using a rod or stick dip it into the drain line until it reaches the bottom of the trap.

Remove the rod and measure the wetted depth of the rod or stick used.

Subtract the appropriate trap neck (B) based upon the p-trap size:

Trap Neck (B) is 2 inches for a 3 inch P-trap.

Trap Neck (B) is 1.375 inches for a 2 inch P-trap.

If the result is between 2 and 4 inches then the water seal is code compliant.

That's about it. I hope this was helpful and gave you a better understanding of our little friend Petey the P-trap. He can be a headache but if you treat him right he can be a lifelong friend… well sort of.